CLAIMS

We claim:

1. A composition comprising a polynucleotide sequence, wherein the polynucleotide sequence comprises an *AIPL1* sequence within the LCA4 region of chromosome 17p13 and is selected from the group consisting of a wild-type AIPL1 sequence and a mutant AIPL1 sequence.

2. The composition of claim 1, wherein the mutants are selected from the group consisting of Ala336Δ2, Trp278X, Cys239Arg, M79T, L88X, V96I, T124I, P376S, Q163X, A197P, IVS2-2, G262S, R302L, P351D12, Cys42X (TGT -> TGA), Val33ins 8 bp (GTGATCTT), Leu257del 9 bp (CTCCGGCAC) and mixtures and combinations thereof.

3. A protein comprising SEQ. ID. NOs. 72-78 and variants of the protein of SEQ. ID. NO. 72, or a polypeptide expressed by a polynucleotide comprising a nucleotide sequence selected from the group consisting of SEQ. ID NOs. 1-8 or mutants of SEQ. ID. NO. 1 selected from the group consisting of SEQ. ID Nos. 9-41.

4. A purified polynucleotide sequence comprising a sequence selected from the group consisting of SEQ ID NOs. 1-71.

5. A retinal disease diagnostic library comprising anti-sense DNA sequences, each sequence corresponding to a DNA sequence including a mutation of the AIPL1 gene selected from the group consisting of SEQ. ID Nos. 9-41 and mixtures and combinations thereof.

6. A primer comprising an AIPL1 sequence, wherein the AIPL1 sequence is selected from the group consisting of a wild-type AIPL1 sequence and a mutant AIPL1 sequence, wherein the mutant-AIPL1 contributes to a retinal disease.

7. The primer of claim 6, further comprising a polynucleotide sequence selected from the group consisting of SEQ ID NOs. 42-47 and 60-71.

8. A probe comprising an AIPL1 sequence, wherein the AIPL1 sequence is selected from the group consisting of a wild-type AIPL1 sequence and a mutant AIPL1 sequence, wherein the mutant-AIPL1 contributes to a retinal disease.

9. A method to determine if an animal has a retinal disease or has a propensity to pass a retinal disease to offspring, comprising the steps of:

(a) extracting polynucleotide from a cell or sample;

(b) determining if the polynucleotide contains a mutation in an AIPL1 encoding or regulating region; and

(c) correlating the presence of the mutation as an indication of a retinal disease or a propensity to pass a retinal disease to offspring.

10. The method of claim 9, further comprising the steps of:
obtaining a patient sample; and
amplifying the polynucleotide.

11. The method of claim 10, wherein the amplifying is done via polymerase chain reaction.

12. The method of claim 9, wherein the determining is done via polynucleotide sequence.

13. The method of claim 9, wherein the mutations are selected from the group consisting of Ala336Δ2, Trp278X, Cys239Arg, M79T, L88X, V96I, T124I, P376S, Q163X, A197P,

IVS2-2, G262S, R302L, P351D12, Cys42X (TGT -> TGA), Val33ins 8 bp (GTGATCTT), Leu257del 9 bp (CTCCGGCAC) and mixtures and combinations thereof.

14. A therapeutic method to treat retinal disease comprising the step of administering to an animal an effective amount of a protein encoded by a wild-type AIPL1 gene or a polynucleotide sequence a wild-type AIPL1 gene or a retinal medication designed to ameliorate disease symptoms to the patient if the mutation is detected or mixtures or combinations thereof.

15. The method of claim 14, wherein the medication is an drug that inhibits retinal cell death.

16. The method of claim 14, wherein the mutations are selected from the group consisting of Ala336Δ2, Trp278X, Cys239Arg, M79T, L88X, V96I, T124I, P376S, Q163X, A197P, IVS2-2, G262S, R302L, P351D12, Cys42X (TGT -> TGA), Val33ins 8 bp (GTGATCTT), Leu257del 9 bp (CTCCGGCAC) and mixtures and combinations thereof.

17. A method to determine if a patient has a mutant AIPL1 gene comprising:

(a) extracting AIPL1 polypeptide from a cell or sample from the patient;

(b) determining if the polypeptide contains an AIPL1 mutation; and

(c) correlating the mutation as an indication of a retinal disease.

18. The method of claim 17, wherein the mutations are selected from the group consisting of Ala336Δ2, Trp278X, Cys239Arg, M79T, L88X, V96I, T124I, P376S, Q163X, A197P, IVS2-2, G262S, R302L, P351D12, Cys42X (TGT -> TGA), Val33ins 8 bp (GTGATCTT), Leu257del 9 bp (CTCCGGCAC) and mixtures and combinations thereof.

19. A method of producing a cell expressing an AIPL1 mutation comprising transfecting a cell with a polynucleotide sequence having at least one AIPL1 mutation in the sequence.

20. The method of claim 19, wherein the encoded mutation is selected from the group consisting of are selected from the group consisting of Ala336Δ2, Trp278X, Cys239Arg, M79T, L88X, V96I, T124I, P376S, Q163X, A197P, IVS2-2, G262S, R302L, P351D12, Cys42X (TGT -> TGA), Val33ins 8 bp (GTGATCTT), Leu257del 9 bp (CTCCGGCAC) and mixtures and combinations thereof.

21. A method for determining the presence of an AIPL1 mutant in a patient sample, which comprises:

(a) isolating polynucleotide extracted from the patient sample;

(b) hybridizing a detectably labeled oligonucleotide to the polynucleotide isolated in step (b), the oligonucleotide having at its 3' end at least 15 nucleotides complementary to a wild type polynucleotide sequence having at least one mutation;

(c) attempting to extend the oligonucleotide at its 3'-end;

(d) ascertaining the presence or absence of a detectably labeled extended oligonucleotide; and

(e) correlating the presence or absence of a detectably labeled extended oligonucleotide in step (e) with the presence or absence of a AIPL1 mutation.

22. The method of claim 21, further comprising taking a patient sample prior to the isolating step.

23. The method of claim 21, wherein the isolated nucleic acid is amplified prior to hybridization.

24. The method of claim 21, wherein the detectable label on the oligonucleotide is an enzyme, radioisotope or fluorochrome.

25. A test kit useful for the detection of AIPL1 mutations comprising a container containing at least one polynucleotide capable of hybridizing with a polynucleotide encoding at least one mutation selected from the group consisting of Ala336Δ2, Trp278X, Cys239Arg, M79T, L88X, V96I, T124I, P376S, Q163X, A197P, IVS2-2, G262S, R302L, P351D12, Cys42X (TGT -> TGA), Val33ins 8 bp (GTGATCTT), Leu257del 9 bp (CTCCGGCAC) and mixtures and combinations thereof.

26. A method of screening compounds to determine their effectiveness in counteracting a cell's retinal behavior due to a mutation in its AIPL1 gene comprising:

(a) contacting the compound with a cell including a mutation is its AIPL1 gene where the mutation is selected from the group consisting of Ala336Δ2, Trp278X, Cys239Arg, M79T, L88X, V96I, T124I, P376S, Q163X, A197P, IVS2-2, G262S, R302L, P351D12, Cys42X (TGT -> TGA), Val33ins 8 bp (GTGATCTT), Leu257del 9 bp (CTCCGGCAC) and mixtures and combinations thereof; and

(b) determining if the cell is affected by the compound.

27. A method to determine if a cell or sample has an AIPL1 mutation comprising:

(a) extracting polynucleotide from a cell;

(b) amplifying polynucleotides which encode AIPL1; and

(c) determining if the polynucleotide contains a mutation;

(d) correlating the presence of the mutation as an indication of a retinal disease or a propensity to pass a retinal disease to offspring.